Lecture Module - Sensors

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

Topic 2 - IC and MEMS based Sensors

Topic 2 - IC and MEMS based Sensors

- Integrated Circuits
- Micro Electro-Mechanical Devices
- Accelerometer
- Compass or Orientation Sensor

Integrated Circuits

Image: Theory and Design of Mech. Meas.

Integrated Circuits

Actvitity: Group Brainstorming
List three applications or devices that use IC based sensors.

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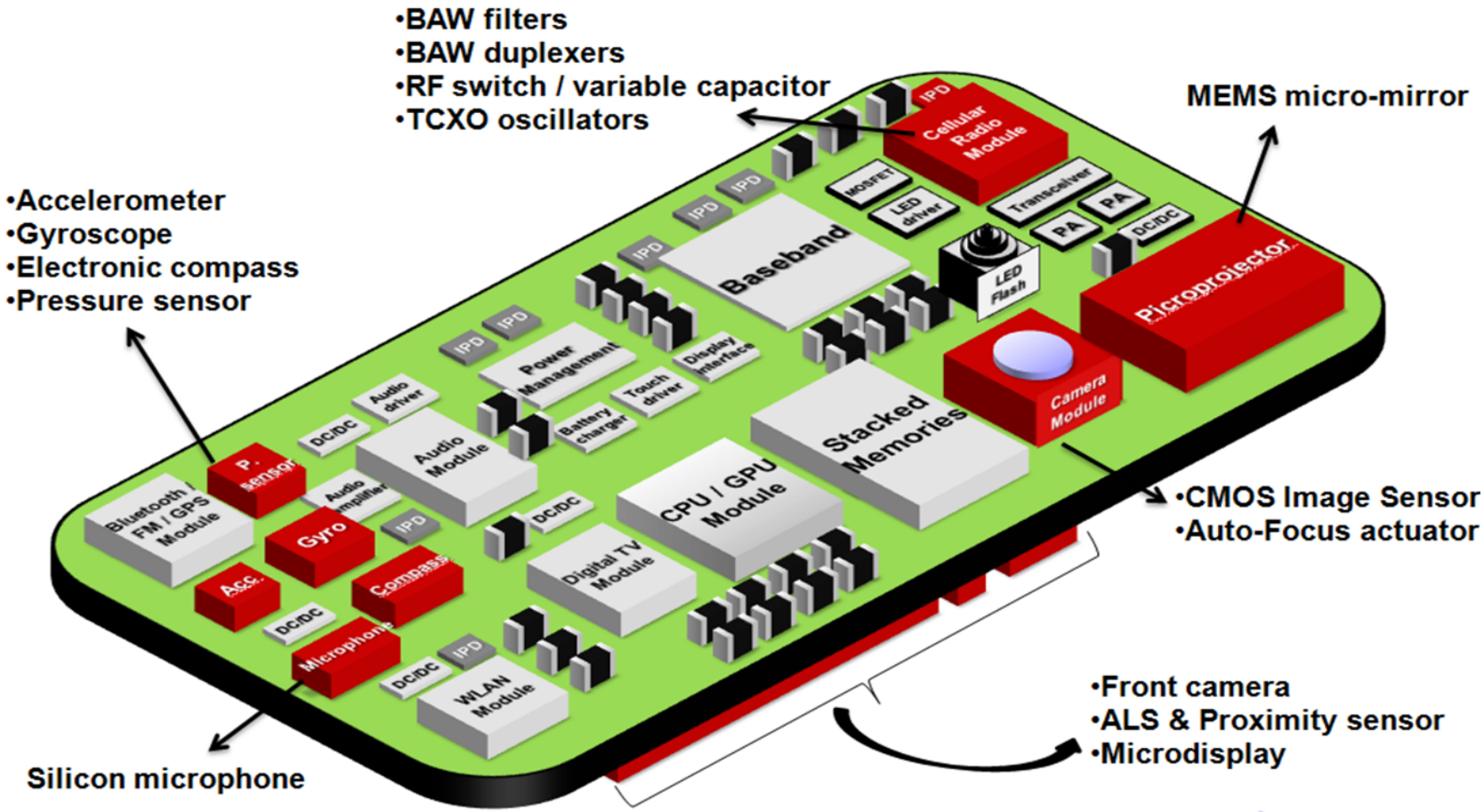
Integrated Circuits



Micro Electro-Mechanical Devices

Actvitity: Group Brainstorming List three sensors that are found on a high performance quadcopter or drone.

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Accelerometer

An accelerometer is a tool that measures proper acceleration, which is the acceleration of a body in its own instantaneous frame.
Applications:

- Navigation Systems - Robotics - Aircraft - Missiles
- Personal Devices - Phones - Tablets
- Others:

Accelerometer

Thought Exercise: How do we measure acceleration?

Actvitity: Group Brainstorming
Explain one method for measuring acceleration of a body.

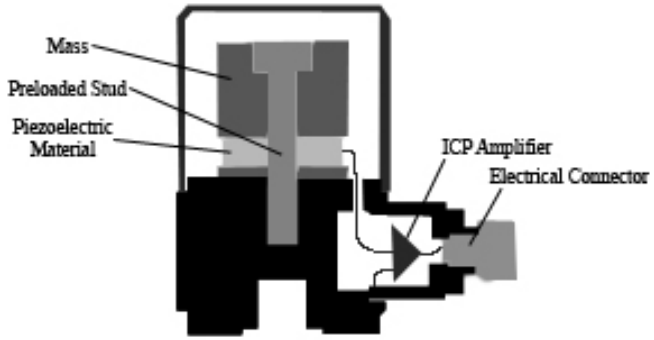
Accelerometer

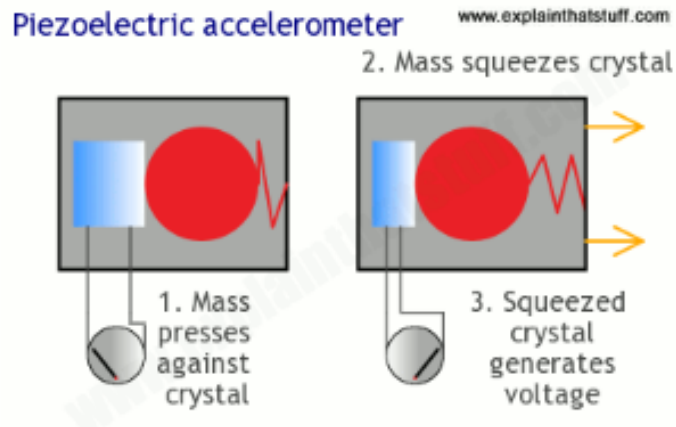
Mechanical Accelerometers Consist of a damped mass spring system and a sensing device.
Types of accelerometers:

- Seismometer or Seismograph
- piezoelectric - charge in material resulting from mechanical stress
- piezoresistive - change in resistance resulting from mechanical stress
- capacitive

Accelerometer

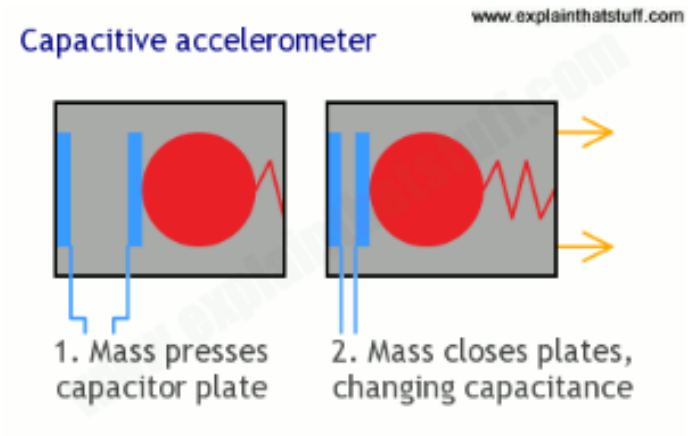
piezoelectric accelerometer





Accelerometer

capacitive accelerometer



Compass or Orientation Sensor

Thought Exercise: How do we measure motion?

- What variable or quantity is used to describe motion?
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- What type of sensor is used to measure this?
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Compass or Orientation Sensor

- What applications require this type of sensor?
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Compass or Orientation Sensor

Thought Exercise: How do we measure orientation?

- What variable or quantity is used to describe orientation?
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- What type of sensor is used to measure this?
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Compass or Orientation Sensor

- What applications require this type of sensor?
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